Indian Institute of Technology, Jodhpur
B.Tech.(CSE) 3rd Year, II (Fall) Sem. 2013-14
32002: Artificial Intelligence Assignment # 1

M.M.: 10

1. Show that a formula in CNF is valid if and only if each of its disjunctions contains a pair of complementary literals P and $\neg P$.

2. Prove or disprove the followings:

   (a) If S is a first-order formula, then S is valid iff $S \to \perp$ is contradiction.

   (b) If S is a first-order formula and x is a variable, then S is contradiction iff $\exists_x S$ is a contradiction.

3. Determine whether the expression p and q unify with each other in each of the following cases. If so, give the *mgu*, if not justify it. Assume that lowercase letters are variables, and upper are predicate, functions, and literals.

   (a) $p = F(x_1, G(x_2, x_3), x_2, B);\ q = F(G(H(A, x_5), x_2), x_1,\ H(A,\ x_4), x_4)$

   (b) $p = F(x, F(u, x));\ q = (F(F(y, A), F(z, F(B, z))))$

4. What can be the strategies for combination of clauses in resolution proof? For example, if there are N clauses, in how many ways they can be combined?

5. Let Γ is knowledge-base and α is inference from Γ. Give a comparison among the following inferences, in terms of their performances:

   (a) Proof by Resolution, i.e., $\Gamma \vdash \alpha$,

   (b) Proof by Modus poenes, i.e., $\Gamma \vdash \alpha$,

   (c) Proof by Resolution Refutation, i.e., $\Gamma \cup \{\neg\alpha\} \vdash \phi$.

6. Given n number of clauses, draw a resolution proof tree to demonstrate combining them. Suggest any two strategies.

Note: Submission deadline 1st Feb. 2013, 23:59 hrs (IST). Assignment shall be submitted online only at email id kr.chowdhary at iitj dot ac dot in, with subject marked as AI-HW1-rollno. Format: pdf, prepared in latex or word.